

Predicting Currency Fluctuations and Crises: Do Resident Firms Have an Informational Advantage?

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Abstract

This paper investigates whether resident enterprise managers have an informational advantage about the countries they work on. We propose a method for extracting information available to resident managers, but unknown to investors and forecasters. We test this informational advantage hypothesis by using a unique data set, the Global Competitiveness Survey. The survey asks local managers about their outlook for the country in which they reside. We find that local managers have private information. Their responses improve conventional forecasts of future volatility and changes in the exchange rate, which are based on economic fundamentals or interest rate differentials. The local business community perceived the recent crises in advance in Korea, Thailand, and Russia, but not in Indonesia and Malaysia.

JEL Classification Codes: F3, F4, G1

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I. Introduction

The recent crises in Mexico, East Asia, Russia, and Brazil have caught many economists, policymakers, and financial markets by surprise. Mexico was forced to devalue its currency shortly after joining the OECD. East Asian countries, with highly regarded policies and long history of high growth and stability, suddenly suffered balance of payments crises. Russia was abruptly cut off from international credit, having to restructure its sovereign debt. While the crisis in Brazil was at the end widely expected, the economic recovery following the devaluation of the real has been, however, surprisingly fast.

In the aftermath of each crisis, the efficient functioning of international financial markets and the nature of crises are revisited. Are crises self-fulfilling? Do investors act as a herd? Are international investors less informed? At the heart of these questions is the flow of information and transparency.

Information is a key element in the theoretical analysis of recent crises. For example, Calvo (1999), Calvo and Mendoza (1999), Kodres and Pritsker (1998), and Rigobon (1998) show that costly information about international investments can produce herding and contagion effects. One explanation goes as follows. As investment opportunities grow, investors diversify their portfolio, holding assets in countries in which they have little information. Therefore, a crisis in one country might prompt uninformed investors to revise their expectations with respect to other countries. Moreover, the fact that informed investors sell assets from a crisis country, for reasons unrelated to fundamentals, might lead uninformed investors to pull out from other emerging markets. Uninformed investors try to extract information from the action of informed market participants. This type of reaction generates contagion or spillover effects across countries. Fundamentally sound economies are affected by panics, herd behavior, and self-fulfilling expectations.

Empirically, these inferior information theories are consistent with many findings. Frankel and Schmukler (1996, 1998) report instances of local investors exiting their markets before international investors at times of crisis — consistent with locals being better informed. Brennan and Cao (1997) look at U.S. equity flows to a sample of developed and emerging markets. They find evidence consistent with asymmetric information. Choe, Kho, and Stulz (1999) and Kim and Wei (1999) analyze data from Korea to study trading patterns by resident and international investors. They

conclude that international investors engage in positive feedback trading. They sell past losers and buy past winners. The evidence from Korea suggests that traders outside the country have less information about the Korean economy than resident investors do.

In the present paper, we use an exclusive data set, the Global Competitiveness Survey (GCS), to study the existence of informational advantages. The GCS is a questionnaire answered by managers located in countries around the world. The survey is collected for the Global Competitiveness Report, produced by the World Economic Forum of Davos and the Harvard Institute for International Development. The survey gathers each manager's perspective on the economic, political, and institutional situation of the country in which each manager resides. The data comprises responses from surveys conducted at the end of 1995, 1996, and 1997.

The GCS data set gives us a unique opportunity to directly test the informational advantage by resident managers. The previous studies on asymmetric information are forced to infer asymmetric information (by different groups of investors) from aggregate flows or price series. Those papers need to assume which groups of investors determine certain flows or prices. On the other hand, the GCS directly reveals what managers think about each country. The timing of the questioners is such that they precede the crises in Asia, Russia, and Brazil. Hence, the survey can be used to test not only general informational advantages, but also whether managers predicted recent crises.

The objective of this paper is twofold. First, we take advantage of the unique data set to investigate whether local managers have private information, not captured by available macro data or by other market indicators. Second, we propose a way of extracting the information available to local managers, but unknown to investors.

The paper is organized as follows. Section II describes some evidence of asymmetric information by looking at recent predictions of crises at different market levels. Section III describes the econometric technique used to extract managers' information. Section IV describes the data and the econometric results. Section V concludes.

II. Predicting Financial Turmoil-The Case of the Asian Crisis

This section analyzes how different groups of investors and market participants have

predicted problems in the economy. We focus on three groups: market indicators, market analysts, and local managers. We compare these indicators across the four Asian countries hit hard by the 1997-98 crisis, namely Indonesia, Korea, Malaysia, and Thailand. We observe these indicators before, during, and after the crisis.

II.a Market Indicators

To study the market indicators we look at holdings of dedicated emerging market funds, international bank exposure, and country funds.

Mutual Funds:

Figure 1 plots holdings and flows (net buying) of dedicated emerging market mutual funds. Just before the crisis started, dedicated emerging market mutual funds held 6.66 billion dollars in Indonesia, 9.43 in Korea, 9.01 in Malaysia, and 4.11 in Thailand. Mutual funds holdings changed drastically by December 1997. Mutual fund holdings decreased to 1.71 billion dollars in Indonesia, 2.31 in Korea, 2.21 in Malaysia, and 2.02 in Thailand.

Mutual fund holdings had decreased in Thailand and Korea even before the crises. This decrease, however, was mainly due to the decline in stock market prices in these countries and not due to net selling. When controlling for the decline in the stock market, we do not see large selling prior to the crisis. The only exception is Malaysia, where net selling of 1.5 billion per quarter started two quarters before the crisis and another 1.5 billion was sold in the third quarter of 1997, after the crisis erupted. In sum, the evidence from mutual funds does not suggest that investors and fund managers were anticipating a crisis in Asia.

International Banks:

Commercial banks have played an important role in emerging economies since the 1980s. Their large exposure during the 1982 Latin American debt crisis prompted U.S. banks to reduce their exposure as a share of their capital. Also, the relative participation of commercial banks in emerging markets has declined as other institutional investors increased their involvement. Commercial banks, still however, have a large exposure in emerging markets. According to the Bank for International Settlements (BIS), international banks had 622 billion dollars in claims in all developing countries by the end of 1995. Around 70 percent of this exposure was held by European and Japanese banks.

To look at the exposure of international banks in Asia, we use the data published by the BIS. Figure 2 reports outstanding claims and changes in net claims in each Asian country. The figure displays consolidated cross-border claims in all currencies and local claims in non-local currencies of international banks in Indonesia, Korea, Malaysia, and Thailand between the end-1995 and mid-1997. The exposure is divided into “short term” (up to one year) and “long term” (over one year).

The total exposure in Indonesia, Korea, Malaysia, and Thailand was around 260 billion dollars by mid-1997. In Korea, Indonesia, and Malaysia, banks’ exposure has been increasing since the end-of 1995, while in Thailand the exposure has been mostly unchanged, after increasing in the beginning of 1996. Among these four countries, only Malaysia has had an increasing proportion of short-term debt.

The BIS figures show that, in Thailand, Indonesia, and Malaysia, most of the lending went to the non-bank private sector. While in Korea, most of the lending went to banks. In general, most of the lending in Asia came from European and Japanese banks. The Japanese presence has been high in Asia. However, its relative presence declined over time, while the European banks increased their relative importance in the area.

One interesting fact is the evolution of net claims (claims minus liabilities). Figure 2 shows that net claims decreased substantially in Korea and Thailand. Given that claims do not decrease, net claims reflect the increase in liabilities of international banks. People from Korea and Thailand increased their claims against the international banking sector. This increase in liabilities seems to reflect capital outflows by Korean and Thai investors.

In sum, international banks did not decrease their exposure in these countries before the crisis, which suggests that there was no change in banks’ expectations between 1995 and the outset of the crisis. At the same time, there seems to be an outflow from domestic residents to the international banks.

Country Funds:

Country funds can also describe the reaction of international investors versus domestic investors. Country funds are traded in New York in the secondary markets. Their price is denominated in U.S. dollars. Another value of the fund, the net asset value (NAV), is calculated on a weekly basis. The NAV reflects the value of the underlying assets, mostly traded in the local

markets. Small international investors are the usual holders of country funds, while domestic investors and large international investors are the usual holders of the underlying assets. The lack of perfect arbitrage enables us to compare the reaction of prices and NAVs during crisis times. Discounts—equal to the percentage difference between prices and NAVs—reflect the small international investors' sentiment relative to the local and large international investors' sentiment.

The analysis of country fund discounts before the Asian crisis, discussed in Frankel and Schmukler (1998), show that in the two Thai country fund discounts turned into premia by the end of 1996. From early-1997, the premia of these funds increased steadily. In the case of Indonesia, discounts turned to premia right before the devaluation. When looking at the Korean and Malaysian funds, one can observe that discounts were shrinking right before the devaluation, but turned into large premia only after each country's currencies were forced to devalue.

In sum, the evidence indicates that the holders of the underlying assets turned more pessimistic than the Thai country fund holders well before the Thai crisis erupted.¹ In the case of the other Asian countries, the country fund data do not suggest that expectations between the two groups of investors were divergent in the month previous to the Asian crisis.

II.b Market Analysts

We now turn to the financial analysts. We investigate how their expectations and evaluations evolved over time, particularly around the Asian crisis. We look at two main groups: currency forecasters and rating agencies.

Currency Forecasters:

The data set from the Currency Forecasters Digest contains the average exchange rate forecast made by multinational companies and by currency traders. The forecasts are for 1, 3, 6, and 12-month horizons. Figure 3 displays the average forecasts from the beginning of 1996 up to April 1998 for Indonesia, Korea, Malaysia, and Thailand.

The graphs suggest that in Indonesia forecasts are very much in line with the current spot exchange rate until the end of July 1997. At the end of July 1997, the 12-month forecast was 20 percent above the current spot rate. The 12 month-forecast was 2,900 ruphias per dollar, while the

¹ Similar evidence was found in Frankel and Schmukler (1996) for the case of the Mexican crisis of 1994-95.

exchange rate was 2,434. By the end of October 1997, the exchange rate had already jumped to 3,405. At that time, expectation had adjusted and the 12-month forecast moved to 4,545 ruphias per dollar. Even though expectations adjusted after the crisis erupted, currency forecasters did not expect the extent of the continuing depreciation of the ruphia. By December 1997, the exchange rate was 5,402 and by January 1998 the exchange rate already reached 12,950 ruphias per dollar.

The data from Korea show a similar picture. The exchange rate forecast moved with the spot exchange rate. Forecasters expected a small depreciation of the Korean won. Up to the end of November 1997, the 12-month expected depreciation was around 5 percent, never exceeding 10 percent. The expected depreciation at 1-month, 3-month, and 6-month was even lower. However, between November and December 1997 the Korean won devalued close to 40 percent.

In the case of the Malaysian ringgit, a comparable story can be observed. Up to the end of June 1997, the forecasted devaluation was usually below 2 percent, even for the 12-month horizon. During August and September 1997, the ringgit devalued close to 11 percent. In October 1997, expectations adjusted. The 12-month forecasted depreciation jumped to 13 percent. A related story can be told about the Thai baht, the long-term expected depreciation jumped to 12 percent in October 1996 and June 1997, while in February 1997 it was close to zero. In July 1997, the Thai baht devalued 28 percent.

To sum, the data from the Currency Forecasters Digest suggests that there was a perception that the Thai baht exchange rate might move in the near future. Currency forecasters perceived some exchange rate movements in Indonesia and Korea, with expected devaluation below 10 percent. In Malaysia, currency forecasters hardly perceived any future devaluation even for the following 12-months. Currency forecasters predicted a small change in the exchange rate. None of the forecast, however, predicted the magnitude of the devaluations triggered after July 1997.² The currency forecasts appear to revise their predicted exchange rate whenever the spot rate moves.

Rating Agencies:

Now we turn to investigate the analysts' evaluations of the economy. We use the following

² This evidence is consistent with the findings by Goldfajn and Valdes (1998).

sources: Standard & Poor's McGraw-Hill Global Risk Service, Moody's, and Standard & Poor's (S&P's) ratings.

Standard & Poor's McGraw-Hill Global Risk Service produce ratings by specialists and analysts with a regional focus. The ratings are on a scale of 1 to 100. The ratings represent a probability measure, i.e. the risk that something "bad" might happen. The higher the score, the larger the probability of a crisis. The data includes 33 immediate risk events.

In the present, we work with the short-term risk of a 5 percent domestic demand fall and with the short-term risk of a 25 percent equity price fall. Figure 4 plots the evolution of these two variables. The dark gray bars represent values for Indonesia, Korea, Malaysia, and Thailand from the third quarter of 1996 to the fourth quarter of 1997. For comparison, the light gray bars represent values for other South East Asian countries, Latin American countries, and OECD countries.

Figure 4 shows that, before the crisis, the probability of a 5 percent demand fall remains fairly steady in all Asian countries as well as in the other regions. The probability increases slightly in Korea, Malaysia, and Thailand in the quarters before the crisis. However, the probabilities remain below 10 percent. On the other hand, after the crisis, the probabilities are updated. For instance, in Indonesia and Thailand, the probability jumps to 70 percent.

Figure 4 also displays the probability of a 25 percent equity price fall. These probabilities do not increase before the crisis, except a very small increase in Indonesia, where the probability remains below 35 percent. In Malaysia, the probability is totally flat. In Indonesia and Thailand, the probability decreases, even after the crisis began. On the other hand, in Korea, the probability remains flat at 10 percent. It only increases in the fourth quarter of 1997 to 35 percent. After the crisis started the probabilities in all other regions increase.

Additionally, we analyze the S&P's sovereign debt ratings.³ Figure 5 shows how better ratings were obtained in mid 1990s. These ratings dropped sharply in all countries only after the crisis began. Although not reported, the figures from Moody's do not tell a different story. In fact, Ferri, Liu, and Stiglitz (1999) econometrically show that credit rating agencies aggravated the East Asian crisis, after having failed to predict it.

³ Both S&P's and Moody's provide different ratings. There are long-term and short-term ratings. There exist ratings on debt, financial sector, and currencies.

II.c Survey of Local Managers

We use the GCS data to analyze the perspective of local businessmen.⁴ Figure 6 shows the responses to two questions asked to local managers about the likelihood of a future recession and the future volatility of the exchange rate. Respondents provide a rating of the country on a scale of 1 (high volatility) to 7 (stable).

The data show that businessmen expectations were worse in 1997 relative to 1996 in Korea and Thailand, and to some extent in Malaysia. The most striking change occurs in Thailand, where expectations deteriorated sharply between 1996 and 1997. Businessmen thought that a recession and exchange volatility were more likely during 1997 than during 1996, as if they were anticipating future problems. Meanwhile, in the other Asian countries (including Indonesia), in Latin America, and in OECD countries expectations improved. After the crisis, in December 1997, expectations deteriorated dramatically in Indonesia and Malaysia. Indonesia was the country hit the hardest by the crisis. Expectations on the likelihood of a recession increased in the other regions of the world as well.

The evidence suggests that managers' expectations were partially correct. However, one should be careful from drawing conclusions based solely on managers' response for several reasons. First, it is possible that managers simply use the available macro data. That is, if we look at the macro data we will reach the same conclusions as the managers. In this case, managers do not provide any information that is not captured by the available information. Second, even if managers have valuable private information, it is possible that their interpretation of the macro data is incorrect. Thus, their response, which is based on their private information and their interpretation of the macro data, might be incorrect. In this case, even though managers' expectations are wrong, their private information is still very valuable. Third, it is possible that managers' characteristics affect their response. For example, managers of export-oriented firms might expect higher exchange rate devaluations than managers of import-oriented firms. These issues are taken into consideration in the next section, where we do the econometric analysis.

II.d Comparison across Groups

⁴ The data is fully described in Section 4.

The evidence presented so far suggests that there are signs of asymmetric information. On the one hand, neither the market indicators nor the market analysts appeared to have anticipated the Asian crisis. International mutual funds, international banks, currency forecasters, and rating agencies did not react as if they were expecting the crisis. The country fund data and the assets of domestic residents in the international banking sector suggest that there was a divergence in expectations in Korea and Thailand. The data suggests that local residents were aware of deteriorating local conditions in those countries. This is confirmed by the survey of local managers.

We have already presented descriptive evidence of informational advantage by local residents. Even though the evidence seems suggestive and is consistent across measures, we would like to formally test differences in information. As mentioned in the introduction, other papers have inferred asymmetric information using data on prices or flows. Here, we use the GCS survey to test econometrically whether managers have informational advantages.

III. Econometric Methodology—Extracting Managers Private Information

Survey of local business people expectations and beliefs may reveal valuable information, unobservable by policy makers or other investors. Local business managers may possess valuable unobserved information because of poor transparency at the micro level—e.g. the financial stability of institutions or firms—or at the aggregate level—e.g. monetary policy, fiscal policy, or the aggregate economic conditions. One, therefore, should incorporate information known to managers, in addition to all other available information, when evaluating the economic conditions.

In this section we describe how to extract the managers' private information from the survey. The managers' response is a combination of their private information and their forecast based on available information. If managers form their expectations rationally and have all available information, then there is no gain in extracting their private information. We could simply use their response as the sole explanatory variable.

If managers, however, do not form expectations rationally or do not have all available information, then predicting the economic conditions based solely on their response may be misleading. For example, suppose that managers form expectations on exchange rate volatility based only on GDP per capita, in addition to their private information. That is, managers in countries with

high income expect a stable currency, while managers in countries with low income expect a volatile currency. Managers' response by itself, in this case, does not reveal any information about future volatility. One must, therefore, decompose the managers' response into the managers' expectations based on available data and the managers' private information. In other words, managers' response may be incorrect and misleading, but their private information may still be very valuable.

Let y_t^i be manager i expectations at time t . The expectation is a function of available information, the manager's characteristics (such as the size of the firm), and the manager's private information \mathbf{e}_t^i .

$$y_t^i = f(\text{available information, managers' characteristics})_t + \mathbf{e}_t^i.$$

Managers' response, however, is categorical. That is, managers' response is as follows:

$$response_t^i = \begin{bmatrix} 1 & \text{if} & y_t^i \leq \mathbf{m}^1 \\ 2 & \text{if} & \mathbf{m}^1 < y_t^i \leq \mathbf{m}^2 \\ 3 & \text{if} & \mathbf{m}^2 < y_t^i \leq \mathbf{m}^3 \\ \dots & \dots & \dots \\ K & \text{if} & \mathbf{m}^{K-1} < y_t^i \leq \mathbf{m}^K \end{bmatrix},$$

where $\mathbf{m}^1, \mathbf{m}^2, \dots, \mathbf{m}^K$ are a set of unknown constants. After replacing y_t^i by $response_t^i$, we can perform the estimation using an ordered probit (or ordered logit) model.

$$response_t^i = f(\text{available information, manager's characteristics})_t + \mathbf{e}_t^i \quad (1)$$

In words, the response of manager i at time t is a function of all available information, the manager's characteristics, and the manager's private information.

After we estimate equation (1), we can extract the managers' private information in two ways. One way is to assume that managers choose the response with the highest estimated probability, where the probability of each response is given by the probit estimation above. Manager j 's private information then is given by the difference between her response and the response with the highest estimated probability, given all the macro variables and the manager's characteristics. That is, managers' private information is given by the difference between the actual response and the response with the highest probability, where the probabilities are estimated from the probit model above:

$$\hat{e}_t^j = \text{response}_t^j - \text{response with highest probability}.$$

A second way to obtain managers' private information is to construct the expectation of a response—the probability of a response time its value. Then, use the difference between the actual response and the expected response as our measure of the manager's private information.

$$\hat{e}_t^j = \text{response}_t^j - \sum_{k=1}^7 k \times \text{Prob}(\text{response} = k),$$

where the probabilities are estimated from the probit model above. In words, we assume that managers assign probabilities to each category conditional on the macro variables. Then, use these probabilities to calculate the mean. The difference between the actual response and the expected response is the managers' private information. The second method, in a sense, assumes that managers minimize their forecast's error, while the first method assumes that managers choose the respond with the highest probability.

Our econometric results are robust to the specification, and hence we present the results using only the first approach; namely, we assume that managers choose the response with the highest probability. We do not have, however, any theoretical or empirical base to prefer the first method to the second one. Further theoretical and empirical research is needed to evaluate the way that managers form their expectations.

After we extract the managers' private information, we test whether managers indeed have private information, not captured by macro variables and not available to other market participants. First, we combine the private information of all managers in the same country and construct a country-specific variable that captures the private information available to managers. That is, we average the private information of all managers in the same country.⁵ Then, we test whether this variable can help predict future volatility and devaluations, after controlling for macroeconomic variables and market expectations.

Before we turn to the results, it is important to note the differences between using extracted private information and managers' response. If the response was not categorical and there were no

⁵ One might consider different ways of aggregating managers' private information. For example, one may argue that only few managers have private information. In this case, one should use only those responses with large residuals rather than the average residuals.

specific managers' characteristics, there would be no advantage in extracting the private information (in terms of forecasting). The only advantage would be that one could identify the private information specifically. But the results would be identical whether we use the response or the extracted private information. Given that the response is categorical and managers may have specific characteristics, extracting the information is superior (since it captures the discontinuous categorical response and managers' specific characteristics). Moreover, extracting the information allows different assumption about the way managers choose their response—choosing the response with the maximum probability or choosing the mean response—as well as different ways of aggregating over all managers from the same country.

IV. Data and Results

IV.a Data

The first GCS-WEF survey took place in December 1995-January 1996. The second survey was conducted over the period December 1996-January 1997. The third survey was conducted over the period December 1997-January 1998. Each questionnaire consists of about 150 questions with answers ranked from 1 to 7 for the 1997-8 survey and 1-6 for the 1996 survey. We focus the analysis on a specific question, which capture the business people expectations regarding the exchange rate volatility of the local currency.

The data set includes 58 countries (49 in 1996, 58 in 1997, and 54 in 1998).⁶ The average number of respondents from each country is 41, such that over all the data set includes 7,169 observations (1,524 in 1996, 2,795 in 1997, and 2,850 in 1998). The questions/statements for 1996 are slightly different from the question for 1997 and 1998. The statements given to the managers in each year are the following.

Question 2.05 (1996): The exchange rate of your country is expected to be very stable in the next 2 years.

⁶ The countries we include are: Argentina, Australia, Austria, Belgium, Brazil, Canada, Switzerland, Chile, China, Columbia, Costa Rica, Czech Republic, Germany, Denmark, Egypt, Spain, Finland, France, Great Britain, Greece, Guatemala, Hong Kong, Honduras, Hungary, Indonesia, India, Ireland, Island, Israel, Italy, Jordan, Japan, Korea, Luxembourg, Mexico, Malaysia, Nicaragua, Netherlands, Norway, New Zealand, Peru,

Question 1.08 (1997) & (1998): The exchange rate of your country is not expected to be very volatile in the next year.

Managers were asked to comment these statements on a scale from 1 to 7 in 1997 and 1998 and on a scale from 1 to 6 in 1996. A response of 1 (7) means that they disagree (agree) with the statement. (That is, expect the exchange rate to be stable in the next 2 years for 1996 and not expect a volatile exchange rate for the next year in 1997 and 1998.) The mean response by country and year is 4.57 and the standard deviation is 1.11. The mean of responses by country and year ranges from 6.53 to 1.53. The highest mean response (6.53) is for Argentina in 1998 and the lowest mean response (1.53) is Venezuela in 1996.

To capture managers' expectations based on public information we use available macro and financial variables known at the time of the survey. We use the variables identified in the literature as important in predicting financial crises and exchange rate fluctuations.⁷ Specifically, we work with the following variables: the ratio of reserves to monthly import values, the current account surplus (+) or deficit (-) expressed as percent of GDP, the change in reserve over credit, the growth rate of domestic credit, and the inflation rate. We also examine several other variables, such as the reserves to deposits ratio, the short-term debt to reserves ratio, broad money (M2) to reserves ratio, the terms of trade growth, the budget surplus (deficit) as percent of GDP, and the GDP growth. The sources of the data are the International Financial Statistics and the World Bank Global Development Finance (GDF) & World Development Indicators (WDI).

Managers' responses might be affected also by their characteristics. For example, managers of large international firms may respond differently than managers of small local firms, even if they have the same information. We have data on managers' characteristics only for 1997 and 1998. The two characteristics are the location of its headquarters—international or domestic—and whether its sales are primarily international or domestic. In 1997, 13.1 percent of the firms in our sample had an international headquarter and 34.4 percent had mostly international sales. In 1998, 18.2 percent of

Philippines, Poland, Portugal, Russia, Singapore, El Salvador, Slovakia, Sweden, Thailand, Turkey, Taiwan, Ukraine, United States of America, Venezuela, Vietnam, South Africa, and Zimbabwe.

⁷ See, for example, Frankel and Rose (1996), Sachs, Tornell, and Velasco (1996), Esquivel and Larrain (1998) and Martinez-Peria (1998).

the firms in our sample had an international headquarter and 26.0 percent had mostly international sales.

The dummy variable for the headquarters' location takes value of 1 if the headquarter is located outside of the country and 0 if it is located domestically. The dummy variable for the sales' orientation takes value of 1 if the firm's sales are primarily international and 0 if the sales are primarily within the country.

IV.b Estimation

Ordered probit estimates:

Table 1 presents the results from the ordered probit model estimation. The dependent variable is managers' response and the independent variables are macroeconomic variables, financial variables, and managers' characteristics. There are some differences in the data for 1996 vis-à-vis the data for 1997 and 1998. As mentioned above, the response in 1996 is on a scale of 1 to 6 while the responses in 1997 and 1998 are on a scale of 1 to 7. High values reflect good prospects for the country. Managers' characteristics in 1996 are not available, and the questions are not identical. Therefore, we estimated the ordered probit for 1996 and for 1997-98 separately.⁸ The results for 1997 and 1998 are presented first, while the results for 1996 are in the adjunct columns.

The macro and financial variables are statistically significant and have the "right" sign. The current account (as percent of GDP) has a positive sign, implying that managers believe that a higher current account surplus (deficit) decreases (increases) the exchange rate volatility. In other words, a high current account surplus is positively correlated with the managers' response. The ratio of reserves to monthly import values is positive and significant. Thus, managers believe that higher reserves decrease the exchange rate volatility. Similarly, managers believe that an increase in the ratio of reserve to credit decreases the exchange rate volatility. The coefficients of inflation rate and the growth rate of domestic credit are negative, suggesting that managers believe that inflation and growth in domestic credit increase the exchange rate volatility. The results suggest that managers' expectations are consistent with economic theory.

The managers' characteristics dummy variable for international headquarters is negative,

⁸ We estimated also an ordered probit with all the years combined adjusting the 1-6 responses in 1996 to a 1-7 scale. The results turned out to be similar.

while the dummy for international sales is positive. The result indicates that managers in firms with international headquarters expect the exchange rate to be more volatile. At the same time, exporters expect the exchange rate to be less volatile than managers focused on local sales. In general, it suggests that managers' expectations (or private information) depend on their characteristics.

OLS estimates:

After extracting the managers' private information, we test whether this information is indeed useful in predicting exchange rate volatility. In other words, do managers really have private information about the economy that is not captured by available macro and financial variables? To respond this question, we regress the exchange rate volatility—measured as the standard deviation of monthly exchange rate changes versus the U.S. dollar—on all available information in the previous period and on our estimate of managers' private information. (See Table 3 for summary statistics of the managers' private information variable.)

Specifically, we estimate the exchange rate volatility in country j in period t as a function of macroeconomic variables of country j in period $t-1$ and managers' information about country j in period $t-1$:

$$\text{exchange rate volatility}_t^j = \mathbf{b}' x_{t-1}^j + \mathbf{d}' \text{managers' private information}_{t-1}^j + \mathbf{x}_t^j,$$

where x_{t-1}^j is the set of macroeconomic variables. If managers' private information is valuable in predicting exchange rate volatility, then \mathbf{d} should be negative. That is, a positive residual from the ordered probit estimation (positive private information) should be associated with lower exchange rate volatility.

The results of the OLS estimations are presented in Table 2. The managers' private information variable in Table 2 corresponds to the residual from the same column in Table 1. (Managers' private information in the first column in Table 2 is estimated using the results from the first column in Table 1.) Managers' private information is statistically significant and has the predicted sign in all specifications. This suggests that managers' private information is correct and useful in predicting exchange rate volatility. The exchange rate is more volatile in countries where managers expect so, after controlling for macroeconomic fundamentals.

The coefficient value is about -0.02 depending on the specification. Thus, a decrease of one

point in the managers' response is associated with a 0.02 increase in the exchange rate volatility. (For comparison, the mean volatility is 0.03 and the standard deviation is 0.05.) The macroeconomic variables are not significant except for the growth rate of domestic credit. The fact that most macro variables are insignificant is not very surprising. Our data set is only three years long and previous research has shown that exchange rate crises are hard to predict using macroeconomic data. (See Furman and Stiglitz, 1998.)

Finally, the last column presents the results when we use the managers' response instead of the extracted managers' private information. As explained above, this is identical to using the residuals from a least squared estimation, without managers' characteristics in the first step. Hence, the difference in the results captures the importance of the non-linearity in the probit estimation, the managers' characteristics, and the assumption about how managers form their response (namely, choosing the response with the highest probability or the mean expected response). The variable managers' response has the right sign and is statistically significant, but at a lower significance level and with a lower R^2 . Overall, the results suggest that managers have private information that is not captured by economic fundamentals.

Alternative Specifications:

The fact that local managers have private information, not captured by economic fundamentals, does not imply that managers know something that other market participants do not. Other market participants may have the same information that managers do, but it is not reflected in the variables we chose. To address this problem, we test two alternative specifications.

First, we test whether managers' private information is reflected in market's expectations of exchange rate fluctuations. That is, do expectations of exchange rate devaluation—as captured by the difference in nominal interest rates between a country and the U.S.—incorporate all information about exchange rate movements? Or, do managers have private information that can improve the market's forecast of exchange rate fluctuations? Before we proceed, it is important to note that managers were asked about volatility and not about devaluation.

Table 4 and 5 present the results using the interest rate differentials instead of the macroeconomic variables, where the interest rate differentials is the difference between local discount

rates and U.S. discount rate.⁹ Table 4 presents the result of the probit estimation of managers' response. The independent variables are the interest rate differential and managers' characteristics. The results suggest that the managers' forecast is consistent with market expectations, in the sense that large interest rate differentials are associated with managers expecting large exchange rate volatility.

Table 5 shows the results of regressing the annual depreciation rate on the interest rate differential from the previous period (the expected exchange rate depreciation) and managers' extracted private information, obtained from the probit estimations. The managers' private information is significant and with the right sign. This suggests that local managers have private information that is unknown to market participants. In other words, managers' private information can help predict exchange rate fluctuations after controlling for market expectations—as captured by the interest rate differential.

As a second alternative specification, we examine whether rating agencies, such as S&P's, also have informational advantage in predicting the exchange rate volatility. Rating on long-term debt, denominated in foreign currency, is used as a proxy for the prediction of exchange rate changes. The debt rating ranges from AAA to B, with a total of 15 ratings in our sample. The rating AAA means that the country has extremely strong capacity to meet its financial commitments; it is the highest rating assigned by S&P's. Rating B is the lowest in our sample and is defined as “more vulnerable,” but the debtor currently has the capacity to meet its financial commitments. One should note that these ratings are not of exchange rate volatility or risk, but of the country's capacity to meet its financial commitments. However, we expect these two variables to be correlated.

We first extract the private information of S&P's in the same way we extracted managers' information. In the second step, we use the extracted S&P's and managers' private information to predict exchange rate volatility, along with macroeconomic variables. Table 6 presents the result of the second step. The rating agency's private information is not statistically significant, while the local managers' variable is again significant in explaining the exchange rate volatility. (The result in estimating the exchange rate depreciation is similar to the one with exchange rate volatility.) This

⁹ Data are taken from IFS line 60.

implies that local managers have superior information to forecasters such as S&P's, as long as we capture the exchange rate risk in the S&P's ratings.

As an illustration of managers' foresight, Table 7 lists the 6 countries and years with the highest volatility and the extracted managers' private information (relative to its country mean). For example, managers in Korea expected the exchange rate in 1997 to be very volatile, a value of -1.62 . Indeed, the Korean won was very volatile in 1997. Similarly, managers were correct when expecting that the exchange rates of Indonesia, Russia, Ukraine, and Zimbabwe were going to be very volatile in 1998.

Table 8 lists the 6 countries and years with the lowest volatility, along with the managers' private information. Except for China in 1998, the managers from lowest volatility countries had predicted correctly that the exchange rates of these countries were going to be very stable.

In terms of the Asian crisis, the exchange rate changes, volatility, and managers' private information are presented in Table 9.¹⁰ Managers in both Korea and Thailand in 1997 had private information that a crisis was coming. Note the decrease in managers' expectations from -0.28 to -1.62 in Korea and from 1.15 to -0.74 in Thailand. In Indonesia and Malaysia, however, managers adjusted their expectations only in 1998, after the Asian crisis became evident.

V. Conclusions

The recent financial crises around the world revived the debate on the nature of speculative attacks and the origins of contagion. Several explanations of the cross-country spillover of recent crises lie on the existence of asymmetric information. In this paper, we were able to test whether local managers have an informational advantage with respect to the country in which they reside. Unlike previous papers that use flow or price information to infer the presence of asymmetric information, the GCS survey enabled us to directly test if managers know better.

The first part of the paper suggests that managers in Asia were able to predict the crisis in Korea and Thailand, but not in Indonesia or Malaysia. The evidence presented suggests that there is asymmetric information. Consistent with this finding, both discounts on country funds and holdings by

¹⁰ Note that this is the extracted private information and not the raw response as was presented in Section II.

the international banking sector imply that local residents were leaving the country before foreign investors. The first section of the paper also showed that market participants—like international mutual funds—and market analysts—like currency forecasters and rating agencies—largely did not expect the Asian crisis.

The second section formally tested the informational advantage of local managers. We first extracted the managers' private information. Then, we tested whether the managers' private information can help to predict exchange rate fluctuations. We found, in all specifications, that managers' information help predict future exchange rate movements. Managers seem to have superior information than the one revealed by macroeconomic and financial data. Moreover, managers seem to know better than markets about future exchange rate changes. When compared with the market expectation—measured by interest rate spreads—and with the analysts' information, the managers appear to have valuable private information.

We draw two conclusions from the analysis. The first one is that markets have very limited success in predicting crises. Part of this failure is because market participants do not possess all available information. The second conclusion is that local managers have valuable information that is not reflected in available information or in markets expectations. Thus, we can improve our forecast of crises and economic conditions by using the private information of local managers.

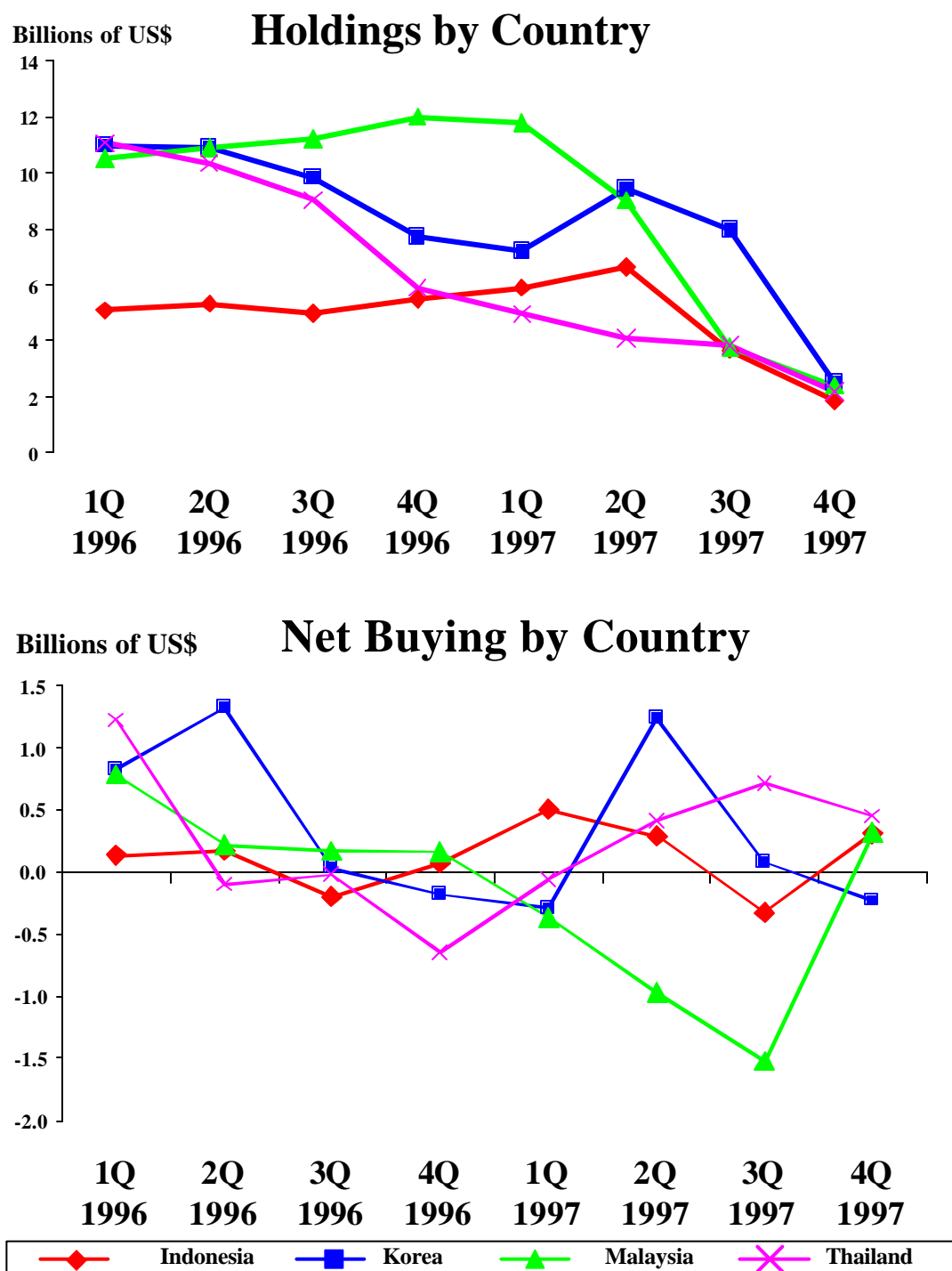
In general, given that many countries have very poor transparency and that markets may be inefficient, a great effort should be undertaken to increase the available information. Using the information of local managers seems a very important and fruitful direction. Thus, more surveys might help to increase transparency and our information set.

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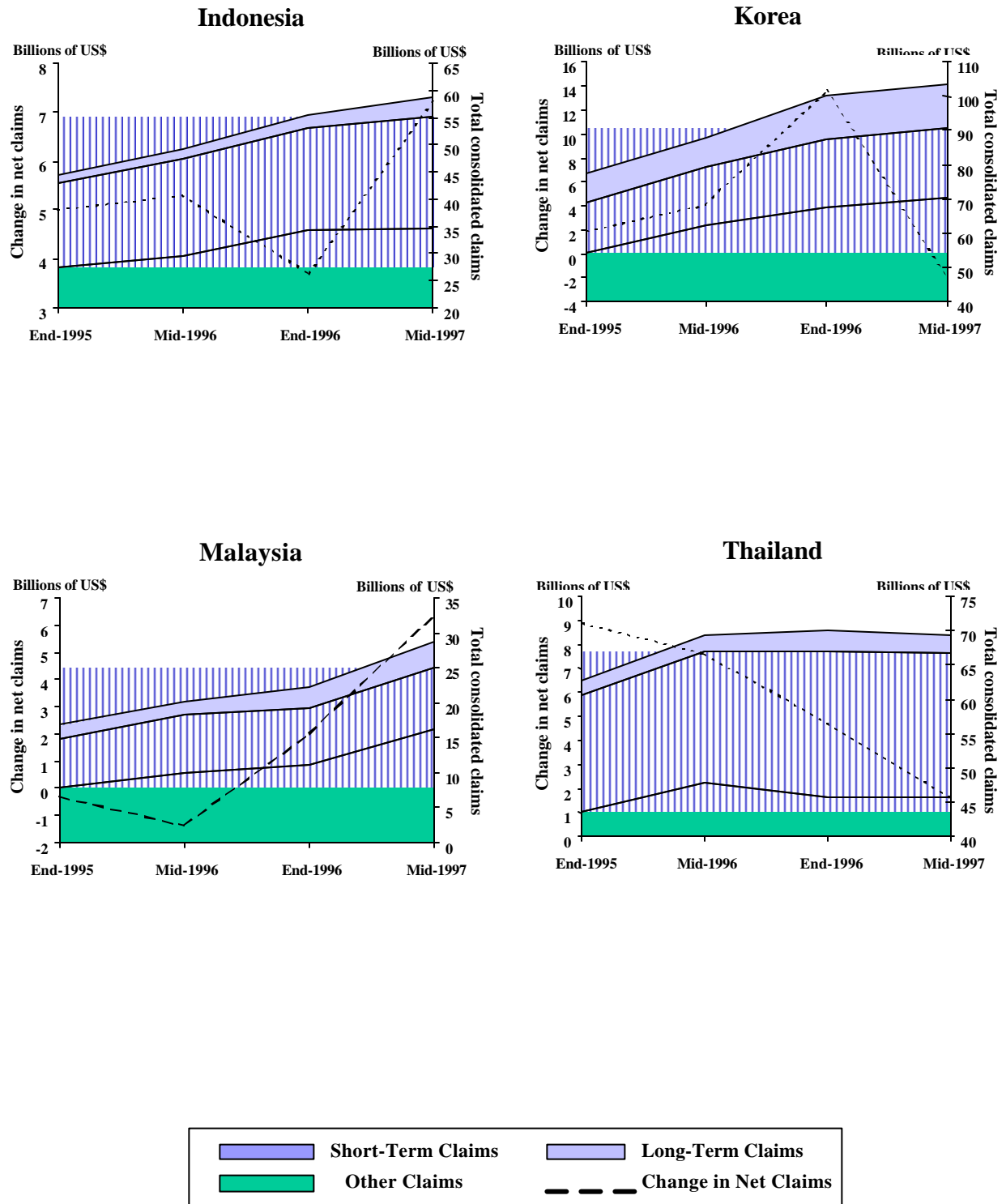
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Figure 1:
Dedicated Emerging Market Mutual Funds Holdings and Buying



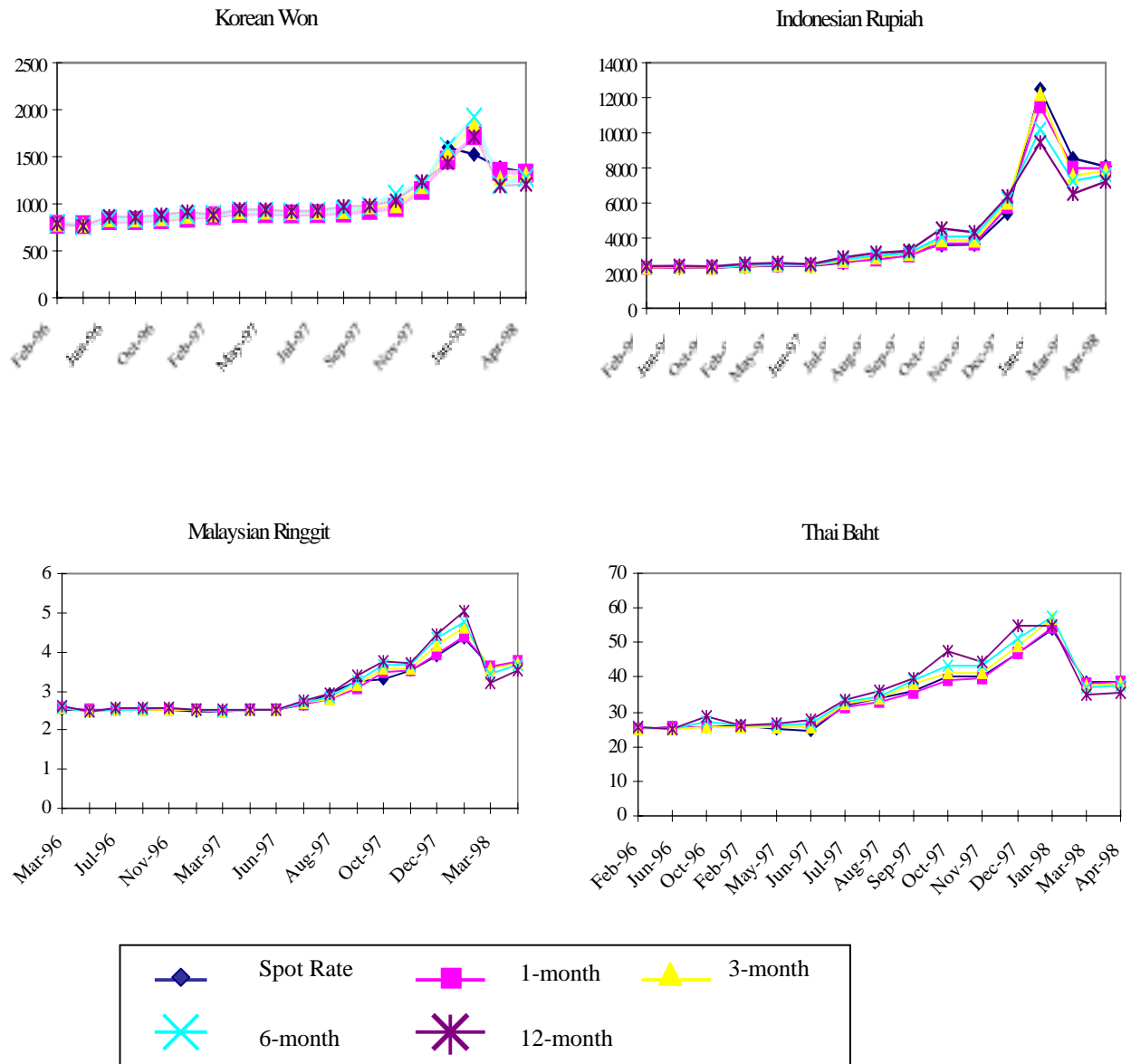
Source: Ian Wilson, Emerging Market Funds Research

Figure 2: Consolidated Claims of International Banks



Source: Bank for International Settlements

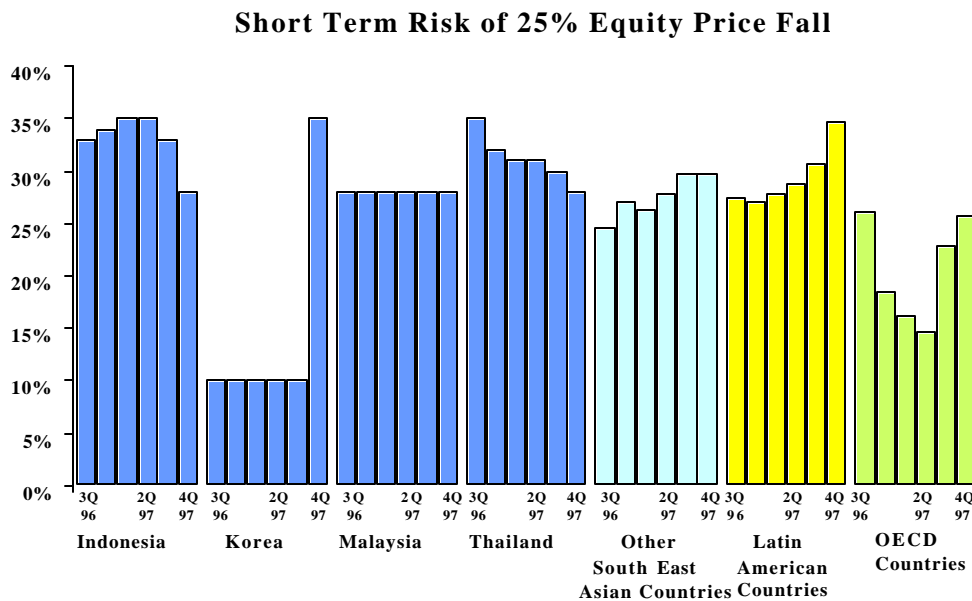
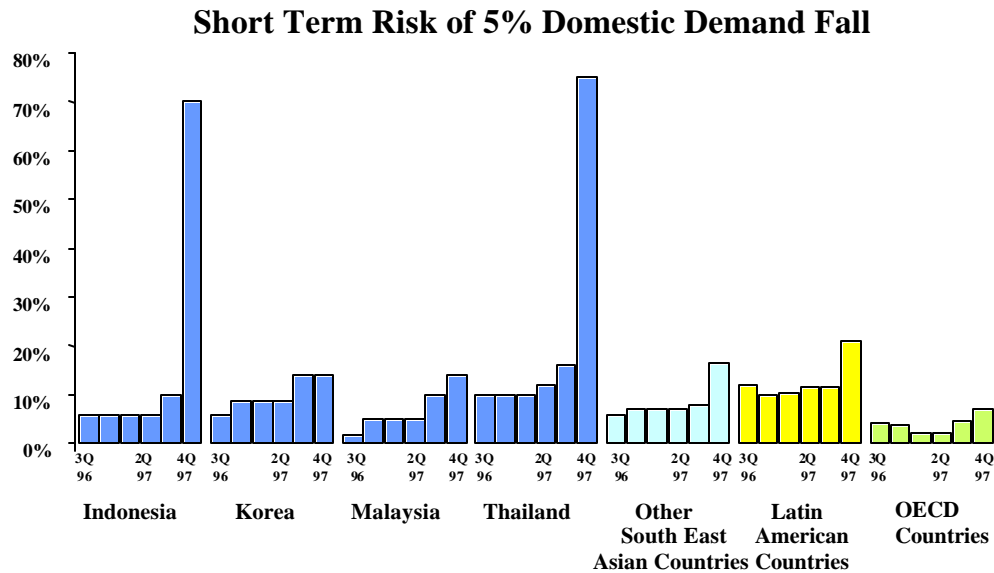
Figure 3: Forecasted and Spot Exchange Rates



Source: Financial Times Currency Forecasts

Figure 4: Investment Risks

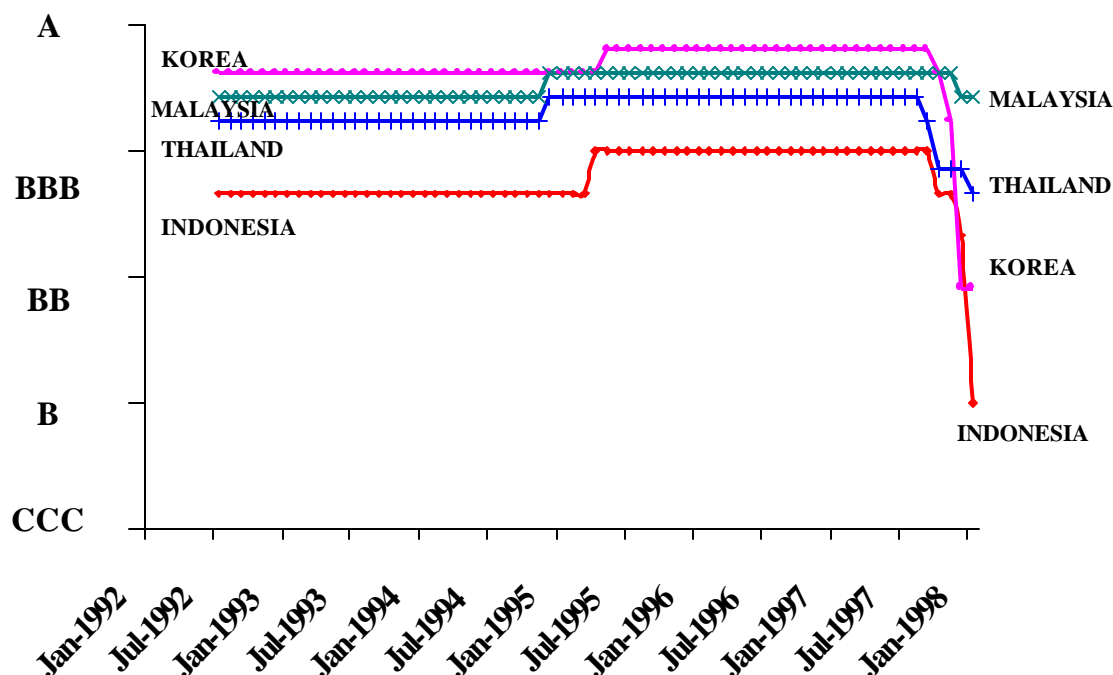
3rd Quarter 1996 – 4th Quarter 1997



Source: Standard & Poor's McGraw-Hill Country Risk Review

“Short Term Risk of 5% Domestic Demand Fall” during any 12-month period and “Short Term Risk of 25% Equity Price Fall” (in local currency) during any 12-month period are identified as potential sources of immediate investment risk.

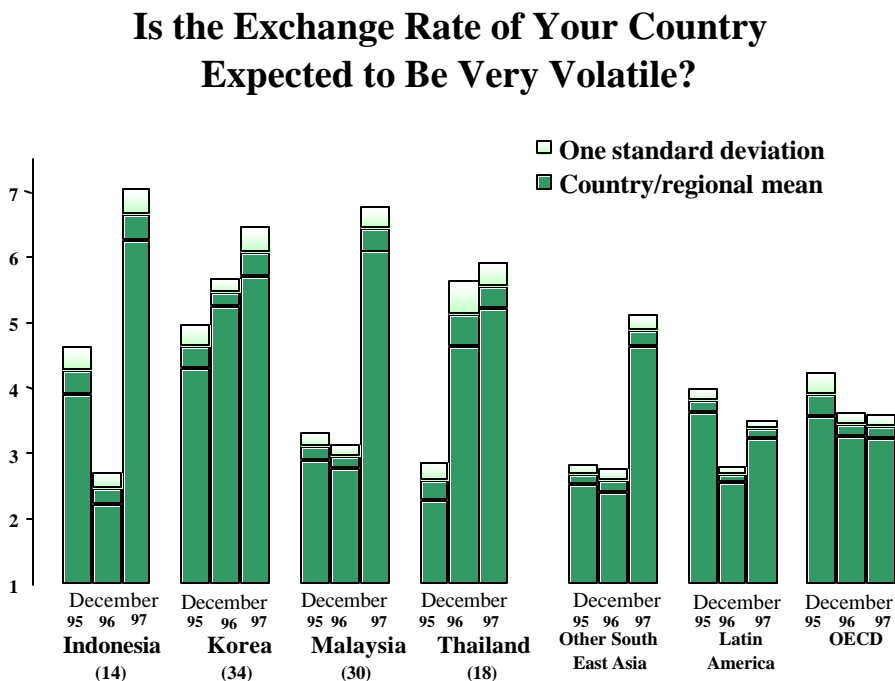
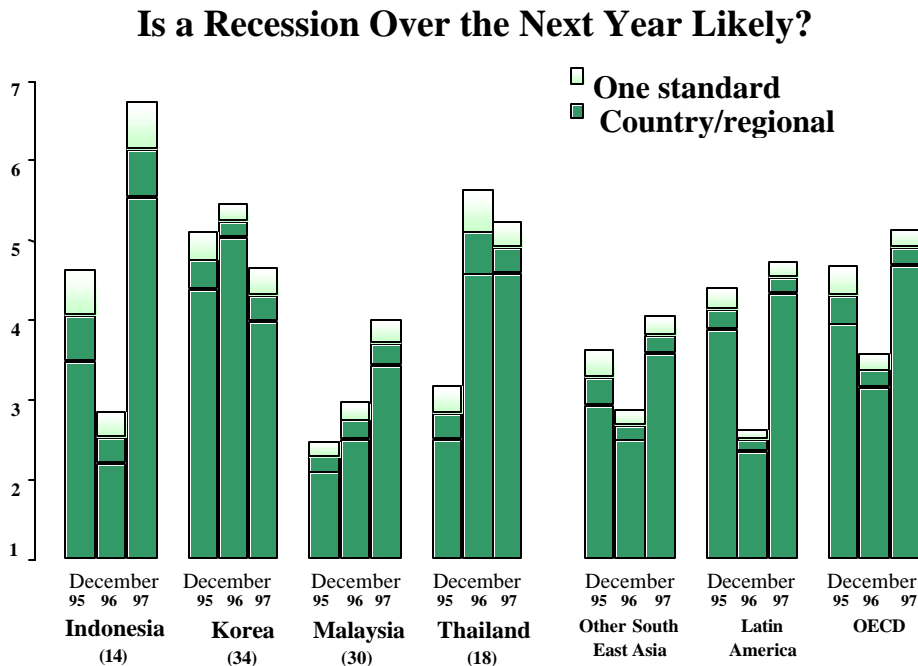
**Figure 5: Standard & Poor's Sovereign Debt Ratings
Long Term, Foreign Currency Debt Risk**



Source: Standard & Poor's Ratings

Standard & Poor's ratings are divided into Secure (ranging from AAA to BBB) and Vulnerable (ranging from BB to C). Ratings from AA to CCC may be modified by a plus (+) or minus (-) sign to show relative standing within the major rating categories. Rating outlook assesses the potential direction of an issuer's rating over the intermediate to longer term, although it is not necessarily a precursor of a rating change. In determining a Rating Outlook, consideration is given to any changes in the economic and/or fundamental business conditions.

Figure 6: The Asian Crisis—Perceptions of Local Firms



Source: World Economic Forum, Global Competitiveness Survey 1996, 1997, 1997

The average number of respondents for all surveys in each country are in parenthesis.

High (low) numbers imply that they agree (disagree) with each question. Note that only for these graphs the questions are formulated differently than in the rest of the paper.

Table 1: Ordered Probit Estimates-Extracting Managers' Private Information:

| Dependent variable: | Response about Exchange Rate Volatility | | | | | | | |
|-------------------------------------|---|---------------------|---|----------------------|---|---------------------|---|----------------------|
| Explanatory Variables at t-1 | Coefficients (z-statistic) 1996 ¹ | | Coefficients (z-statistic) 1996 ¹ | | Coefficients (z-statistic) 1996 ¹ | | Coefficients (z-statistic) 1996 ¹ | |
| Current Account / GDP | 0.02*** (6.21) | 0.00 (-0.42) | 0.03*** (4.55) | -0.09*** (-6.78) | 0.25*** (4.42) | -0.13*** (-6.74) | 0.02*** (7.36) | 0.03*** (3.25) |
| Reserves/Imports | 0.57*** (8.96) | 0.76*** (5.37) | 0.67 (5.48) | -1.81*** (-4.91) | 0.71*** (8.57) | 0.36 (1.45) | 0.55*** (8.68) | 0.61*** (4.3) |
| Change in Reserves/Credit | 0.33*** (2.84) | 0.02 (0.07) | 0.71*** (4.57) | 5.82*** (6.95) | -0.30** (-2.04) | -0.11 (-0.22) | 0.31*** (2.65) | 0.06 (0.16) |
| Inflation | -0.01*** (-5.76) | -0.01*** (-3.39) | -0.01*** (-5.18) | 0.04*** (3.36) | -0.01*** (-4.60) | 0.00*** (1.281) | 0.00 (-0.21) | -0.01*** (-3.46) |
| Growth of Domestic Credit | -0.63*** (-5.15) | -0.94*** (-3.09) | -0.76*** (-4.45) | -6.55*** (-5.99) | -0.40*** (-3.03) | -2.36*** (-6.19) | -0.95*** (-7.46) | -0.10 (-0.31) |
| Change in Terms of Trade | | | 2.06*** (5.24) | 6.49*** (5.58) | | | | |
| Government Budget Surplus/GDP | | | -6.76*** (-6.25) | 16.20*** (7.80) | | | | |
| GDP growth | | | -0.02** (-2.31) | -0.12*** (-11.31) | | | | |
| Reserves/Deposits | | | | | 0.22*** (5.51) | -0.15 (-1.36) | | |
| Short Term Debt/Reserves | | | | | 0.14 (0.53) | -1.11** (-2.27) | | |
| M2/Reserves | | | | | -0.03*** (-4.55) | -0.28** (-2.03) | | |
| Lagged volatility | | | | | | | -7.06*** (-8.89) | -12.85*** (-8.76) |
| Dummy: Int'l Headquarters | -0.06 (-1.41) | | -0.02 (-0.33) | | -0.09* (-1.69) | | -0.07* (-1.70) | |
| Dummy: Int'l Sales | 0.09*** (2.68) | | 0.14*** (2.45) | | 0.07 (1.49) | | 0.09*** (2.71) | |
| Number of Observations | 4733 | 1399 | 2172 | 958 | 3015 | 884 | 4733 | 1399 |
| Log likelihood | -8502 | -2262 | -3869 | -1434 | -5407 | -1369 | -6981 | -2220 |

¹ These columns show the ordered probit estimation that include data from 1996.

Data source: International Financial Statistics and World Bank GDF & WDI database

* Statistically Significant at the 10-percent level

** Statistically Significant at the 5-percent level

*** Statistically Significant at the 1-percent level

Table 2: OLS Estimates – Managers’ Private Information in Explaining Volatility

Dependent Variable: Exchange rate volatility¹

| Explanatory Variables at t-1 | Coefficients (t-statistics) | Coefficients (t-statistics) | Coefficients (t-statistics) | Coefficients (t-statistics) | Coefficients (t-statistics) |
|-------------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|---|
| Managers’ Private Information | -0.02*** (-4.79) | -0.02*** (-2.88) | -0.03*** (-3.82) | -0.01** (-2.46) | Managers’ Response -0.01*** (-3.18) |
| Current Account /GDP | 0.00 (1.10) | 0.00 (0.031) | 0.00 (1.39) | 0.00 (-0.26) | 0.00 (0.81) |
| Reserves/Imports | -0.02 (-1.06) | -0.03 (-0.86) | -0.06 (-1.88) | -0.02 (-1.10) | -0.02 (-0.10) |
| Change in Reserves/Credit | -0.04 (-1.17) | -0.09* (-1.84) | -0.05 (-0.95) | -0.01 (-0.43) | -0.01 (-0.29) |
| Inflation | 0.00 (-0.61) | 0.00 (-1.09) | 0.00 (-1.12) | -0.00** (-2.39) | -0.00* (1.66) |
| Growth of Domestic Credit | 0.07** (2.39) | 0.12** (2.57) | 0.09* (1.97) | 0.07** (2.25) | 0.04 (1.12) |
| Change in Terms of Trade | | 0.25** (2.11) | | | |
| Government Budget Surplus/GDP | | 0.16 (0.81) | | | |
| GDP Growth | | -0.00* (-1.85) | | | |
| Reserves/Deposits | | | -0.01 (-1.04) | | |
| Short Term Debt/Reserves | | | 0.12 (1.30) | | |
| M2/Reserves | | | 0.00 (-1.18) | | |
| Lagged volatility | | | | 0.86*** (5.40) | |
| Constant | 0.01 (1.22) | 0.05** (2.03) | 0.05 (1.67) | 0.00 (0.46) | 0.10*** (4.63) |
| Number of Observations | 129 | 66 | 67 | 129 | 129 |
| Adjusted R-squared | 0.16 | 0.17 | 0.24 | 0.24 | 0.08 |

¹ The exchange rate volatility is calculated as a standard deviation of monthly changes in nominal exchange rates.

Data source: International Financial Statistics and World Bank GDF & WDI database

* Statistically Significant at the 10-percent level

** Statistically Significant at the 5-percent level

*** Statistically Significant at the 1-percent level

Table 3: Summary Statistics of Left-Hand Side Variables and Managers' Private Information

| Variable | # of Observations | Mean | Std. Deviation | Min | Max |
|---|-------------------|-------|----------------|--------|--------|
| Volatility | 146 | 0.03 | 0.05 | 0.00 | 0.42 |
| Depreciation | 146 | 14.83 | 37.16 | -25.11 | 276.48 |
| Managers' Response | 146 | 4.57 | 1.11 | 1.53 | 6.54 |
| Extracted Managers' Private Information | 146 | -1.09 | 1.13 | -4.93 | 1.52 |

Table 4: Ordered Probit Estimates**Interest Rate Differential as Explanatory Variable**

| <u>Dependent Variable:</u> | <u>Response</u> | |
|-------------------------------------|--------------------------------|---------------------|
| <u>Explanatory Variables at t-1</u> | Coefficients (z-statistics) | 1996 ¹ |
| Interest Rate Differential | -0.01*** (-5.95) | -0.01*** (-9.69) |
| Dummy: Int'l Headquarters | -0.04 (-0.71) | |
| Dummy: Int'l Sales | 0.16*** (4.03) | |
| Number of Observations | 3852 | 1030 |
| Log likelihood | -7001 | -1674 |

^{1/} The exchange rate volatility is calculated as a standard deviation of monthly change of nominal exchange rates.

*** Statistically Significant at the 1-percent level

Table 5: OLS Estimates

Managers' Private Information and Interest Rate Differential

Dependent Variable: **Exchange Rate depreciation**

| <u>Explanatory</u> | Coefficients |
|--------------------------------|----------------|
| <u>Variables at t-1</u> | (t-statistics) |
| Managers' Private | -6.50*** |
| Information | (-3.24) |
| Interest Rate Differential | 0.39*** |
| | (3.49) |
| Constant | 1.34 |
| | (0.41) |
| <hr/> | |
| Number of Observations | 106 |
| Adjusted R-squared | 0.17 |

*** Statistically Significant at the 1-percent level

**Table 6: OLS Estimates of Exchange Rate Volatility
with S&P's and Managers' Private Information**

| <u>Dependent Variable:</u> | Exchange rate volatility ¹ |
|-------------------------------------|--|
| <u>Explanatory Variables</u> | Coefficients (t-statistics) |
| Managers' Private Information | -0.017*** (-3.85) |
| S&P's Extracted Information | 0.00 (0.12) |
| Current Account as % of GDP | 0.000 (0.27) |
| Reserve/Import | -0.02 (-0.86) |
| Change in Reserve/Credits | -0.01 (-0.21) |
| Inflation | 0.00 (1.01) |
| Growth of Domestic Credits | -0.01 (-0.17) |
| Constant | 0.02 (1.37) |
| Number of Observations | 105 |
| Adjusted R-squared | 0.11 |

^{1/} The exchange rate volatility is calculated as a standard deviation of monthly change of nominal exchange rates.

*** Statistically Significant at the 1-percent level

Table 7: Countries with High Volatility and Managers' Private Information**Sorted from Highest Volatility**

| Country and Year | Exchange Rate Volatility | Managers ¹ |
|-------------------------|---------------------------------|------------------------------|
| Indonesia 1998 | 0.42 | -2.64 |
| Zimbabwe 1998 | 0.31 | -3.84 |
| Russia 1998 | 0.30 | -0.58 |
| Venezuela 1996 | 0.17 | 0.62 |
| Korea 1997 | 0.14 | -1.62 |
| Ukraine 1998 | 0.14 | -1.83 |

Table 8: Countries with Low Volatility and Managers' Private Information**Sorted from Lowest Volatility**

| Country and Year | Exchange Rate Volatility | Managers ¹ |
|-------------------------|---------------------------------|------------------------------|
| Argentina 1998 | 0.0000 | 1.62 |
| Egypt 1998 | 0.0000 | 0.15 |
| El Salvador 1997 | 0.0000 | 1.10 |
| Argentina 1997 | 0.0000 | 1.60 |
| China 1998 | 0.0001 | -0.23 |
| Argentina 1996 | 0.0001 | 1.39 |

^{1/} The managers values are the extracted private information, obtained from the probit models. The values are relative to the country mean.

**Table 9: Volatility, Depreciation, and Managers' Private Information
in Four South East Asian Crisis Countries**

| Country | Year | Volatility | Depreciation Rate | Managers¹ |
|----------------|-------------|-------------------|--------------------------|-----------------------------|
| Korea | 1996 | 0.01 | 10.66 | -0.28 |
| | 1997 | 0.14 | 89.03 | -1.62 |
| | 1998 | 0.08 | -25.11 | -1.68 |
| Thailand | 1996 | 0.00 | 2.82 | 1.15 |
| | 1997 | 0.08 | 65.78 | -0.74 |
| | 1998 | 0.09 | -12.78 | -1.37 |
| Indonesia | 1996 | 0.01 | 3.62 | 0.21 |
| | 1997 | 0.09 | 263.67 | 0.87 |
| | 1998 | 0.42 | -0.23 | -2.64 |
| Malaysia | 1996 | 0.01 | -2.65 | 0.65 |
| | 1997 | 0.05 | 47.97 | 0.42 |
| | 1998 | 0.09 | 3.43 | -2.21 |

^{1/}The managers values are the extracted private information, obtained from the probit models.
The values are relative to the country mean. High values represent low expected exchange rate volatility.